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Merriam's Shrew (*Sorex merriami*) in the Diet of a Mexican Spotted Owl (*Strix occidentalis lucida*) from Grant County, New Mexico

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Abstract

Distributional limits of Merriam's Shrew (*Sorex merriami*) are not well understood across its range in North America due to relatively few records for this widespread species. *Sorex merriami* reaches its southernmost distributional limit in New Mexico, but the species only is known from eight documented localities in the state. We discovered the remains of a single *S. merriami* in a regurgitated pellet of a Mexican Spotted Owl (*Strix occidentalis lucida*) in the Pinos Altos Range, Grant County. This represents the first record of *S. merriami* in the Mogollon Plateau in southwestern New Mexico and the southernmost locality for the species in the United States. This record is best interpreted as a range extension because limited surveys for shrews have been conducted in the region. This record represents the second documentation of Merriam's Shrew as prey for the Mexican Spotted Owl.

Key words: distribution, Merriam's Shrew, Mexican Spotted Owl, Mogollon Plateau, New Mexico, *Sorex merriami*

Introduction

Distributional limits for Merriam's Shrew (*Sorex merriami*) are not well understood due to relatively few records across its broad geographic range in the United States (Armstrong and Jones 1971). Merriam's Shrew occurs in the western United States from the Sierra Nevada and Cascade Range to western North Dakota, western South Dakota, and western Nebraska (Armstrong and Jones 1971; Hall 1981; Mullican 1984; Merlino et al. 2012). The southernmost distributional limits are from the Mogollon Plateau in Arizona and from the Sacramento Mountains in New Mexico (Hall 1932; Diersing 1979; Hoffmeister 1986). Throughout its range, *S. merriami* has been observed in a variety of habitats, including dry grasslands, sagebrush steppes, piñon-juniper woodlands, ponderosa pine forests, and mixed coniferous forests (Armstrong and Jones 1971; Findley et al. 1975; Hoffmeister 1986).

In New Mexico, *S. merriami* is known from eight published localities near or in the Manzano, Sacramento, San Juan, Sandia, Sangre de Cristo, Sierra Grande, and Zuni mountains (Findley 1956; Jones 1961; Diersing 1979; George 1990; Hafner and Stahlecker 2002). Frey (2004) suspected the species likely occurs in the Mogollon Plateau in southwestern New Mexico due to the close proximity of a record of

S. merriami in southeastern Arizona. Herein we report the first record of *S. merriami* from the Mogollon Plateau in southwestern New Mexico and discuss the occurrence of this prey species in the diet of Mexican Spotted Owls (*Strix occidentalis lucida*).

METHODS

We examined 21 regurgitated owl pellets collected from a Mexican Spotted Owl roost located 10 km N, 4 km E Pinos Altos, Grant County, New Mexico. Cranial and mandibular characteristics were used to identify one shrew specimen to species, as we recovered from one of the pellets a single mandible and a nearly complete cranium missing a number of teeth. Another soricid mandible was recovered but there were too many issues in keying it out to be comfortable with identification. To distinguish *S. merriami* from other shrew species, two keys were used (Junge and Hoffmann 1981; Carraway 1995). The single mandible had a well-developed post-mandibular foramen, which narrowed the species to six species of *Sorex* occurring in the United States and Canada (Junge and Hoffmann 1981). Based on the socket size of the 3rd and 4th unicuspids in the partial cranium, the 3rd unicuspid was larger than the 4th unicuspid, eliminating *S. trowbridgii*, a species that is not known to occur in the region (Junge and Hoffmann 1981). Lastly, the front end of the palate was unusually broad forming a wide triangle (Fig. 22 in Junge and Hoffmann 1981) resulting in identification of the skull as *S. merriami*. For additional support of our identification, we used the key in Carraway (1995) to distinguish between the only two species of *Sorex* in the region with a well-developed post-mandibular foramen, that is, *S. merriami* and *S. arizonae*. Height of coronoid process was > 3.9 mm, measuring 4.12 mm, and ratio of height of the coronoid process to the length of the dentary (6.35 mm) was > 0.54 with a ratio of 0.65, thus again providing further support for identification to *S. merriami*. This specimen was deposited in the Museum of Southwestern Biology (MSB #291774), University of New Mexico, Albuquerque.

RESULTS

The partial cranium and mandible of a *S. merriami* was obtained from a roost of a male Mexican Spotted Owl in a small ravine in the Pinos Altos Range. The ravine had a small perennial stream with grassy banks, and Douglas fir (*Pseudotsuga menziesii*) was the dominant tree in the immediate area. The surrounding forest was predominantly ponderosa pine (*Pinus ponderosa*) and Gambel's oak (*Quercus gambelii*). Other remains observed in the pellets included six Mexican Woodrats (*Neotoma mexicana*), six invertebrates, four Botta's Pocket Gophers (*Thomomys bottae*), three voles (*Microtus*), two mice (*Peromyscus*), one Western Harvest Mouse (*Reithrodontomys megalotis*), and one other shrew (unidentifiable mandible, MSB #291775).

DISCUSSION

Owl pellets contain bones and indigestible components of prey, and dissection of pellets is a non-intrusive method that can yield information on regional abundance and distribution of small mammals, including rare and some difficult to sample species (Vernon 1972; Mikkola 1983). Our record of *S. merriami* in the Mogollon Plateau in southwestern New Mexico represents a county record, a new mountain range for this shrew in the state, and southernmost locality for the species. The closest published locality to our record is from near Rose Peak, Greenlee County, Arizona, which is about 123 km WNW of where our pellet was collected (Hall 1932; Hoffmeister 1986). Rose Peak also is located on the Mogollon Plateau. The previous southernmost record in the United States and closest record in New Mexico was from near Mescalero in the Sacramento Mountains, Otero County, located about 235 km ENE of where the pellet was collected (Diersing

1979). We suggest that our record represents a range extension, and not a range expansion (Frey 2009), as this species likely has always occurred in the vicinity but remained undetected, in part due to difficulty in obtaining records of this uncommon shrew species and a general lack of surveys in the area based on relatively few shrews in regional museums from the region. Examination of additional owl pellets and deployment of pitfall arrays likely will allow researchers to further delineate the distributional limits of Merriam's Shrew, as the limits for this patchily distributed species are still not well understood.

Some species of owls migrate, thus the possibility exists that the *S. merriami* was transported from another area during migration. Spotted Owls, however, generally are considered non-migratory across their range (Gutiérrez et al. 1995). Mexican Spotted Owls are known to shift in elevation ≥ 1,000 m seasonally and travel relatively short distances of 20 to 50 km in the local region (Gutiérrez et al. 1995). Such limited movement between seasons lends further support that even if the owl captured the *S. merriami* on its wintering range and regurgitated the pellet at its summer breeding locality, the shrew was at most from the Black Range in Sierra County or other parts of the Mogollon Plateau in Catron County, although we find this scenario rather unlikely.

Mexican Spotted Owls inhabit rugged, narrow canyons and high-elevation forests in the southwestern United States and throughout the Sierra Madre Occidental and Sierra Madre Oriental in Mexico (Gutiérrez et al. 1995; Mullet and Ward 2010). In the southwestern United States, some Mexican Spotted Owls nest in patches of dense trees with high canopy cover in cool areas but forage in more open habitats near roost sites (Willey and van Riper III 2014). Their diet, based on percentage of biomass consumed, primarily consists of woodrats (*Neotoma*), mice (*Peromyscus*), rabbits (*Sylvilagus*), voles (*Microtus*), and Botta's Pocket Gophers, with the remainder including bats, birds, insects, and other small mammals (Ganey 1992; Young et al. 1997; Seamans and Gutiérrez 1999; Block et al. 2005; Ganey et al. 2011; Willey 2013). Although numerous studies have examined the diet of this raptor via pellet analysis, to our knowledge only a single prior study has observed *S. merriami* as a prey item of Spotted Owls (Ganey and Block 2005); thus our observation represents the second record of this prey item for this owl species. Merriam's Shrews also have been observed in the regurgitated pellets of Great Horned Owls (*Bubo virginianus*) and Barn Owls (*Tyto alba*) in California, Nebraska, and Wyoming (Bond 1939; Long and Kerfoot 1963; Merlino et al. 2012). By examining many papers on diets of Spotted Owls throughout their distribution, we conclude that shrews are an uncommon prey item and make up a relatively small percentage of observations and percentage biomass in the diet of this species.

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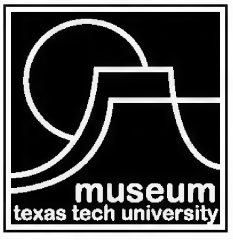

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